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Identification of Research Needs for Low Vision:

Final Report

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### Abstract

The purpose of this project was to review and evaluate existing research on low vision and to identify current research needs for low vision. Approximately 500 abstracts were gathered on low vision research done from the 1950's through 1985. A bibliography was compiled of the 141 best abstracts of articles on educational research which were categorized under 28 subtopics. Experts in the field of low vision were then asked to write "think pieces" identifying research needs in the area of low vision based on the bibliography and their expertise. From the four "think pieces" which were written, 97 specific research needs were suggested. The experts showed some agreement on 16 of these suggestions. The research needs were compared in number and kind to the research reported in the bibliography. There is still much research to be done for low vision and several good places to start are suggested.

Identification of Research Needs for Low Vision:  
Final Report

Purpose The purpose of this project was two-fold: (a) to review and evaluate existing research on low vision, and (b) to identify current research needs for low vision.

Justification This project was undertaken in keeping with the American Printing House for the Blind's philosophy of trying to provide a well-rounded program of educational research and to assess the present state of the art as far as low vision was concerned. Although research in the area of low vision has been ongoing and literature reviews have been done in conjunction with each project, a bibliography in the area of low vision has not been done at APH since 1971 when C. Y. Nolan and J. E. Morris did a Bibliography of Research on Large Type Reading.

The last time an effort was made by APH to identify specific needs in the area of low vision was in 1981 when Ed Berla' and Debbie Willis, held two meetings and surveyed 14 consultants and 10 members of APH's Educational Research and Educational Aids Committees to determine and prioritize needs. Their report states that the highest priority should be to

1. Determine if reading rate can be improved by training low vision readers' decoding skills such as practice discriminating commonly confused letters, letter combinations, words, etc.
2. Identify reading characteristics of low vision persons.
3. Study the perceptual processes underlying all low vision functioning: visual memory and whole-part/part-whole concepts.
4. Determine whether low vision persons can be taught to read smaller print sizes efficiently by gradually and systematically reducing print size.

The following needs for materials were given high priority:

1. An updated, well organized description of skills needed to function in a variety of occupations and the aids that could be used by low vision persons, and adaptations a low vision person might need to make to perform the job.

2. Low vision aids familiarity packet with training materials and/or a manual explaining how to use low vision aids as well as variables that affect visual functioning.
3. Adaptation or development of a reading curriculum that focuses on introductory reading with young low vision children which emphasizes visual efficiency factors and component skills such as identifying first letter of words, anticipation skills, guessing, reducing memory load through chunking, etc.
4. A videotape presentation designed for low vision persons of factors that affect visual functioning and how to maximize efficiency.

With this in mind there seemed to be a need to update our information in the area of low vision.

#### Gathering and Interpreting Data, Part I

Descriptors for the search were identified from such terms as low vision, partially sighted, and visually handicapped. A computer search of Resources in Education, Educational Resources Information Center (ERIC) was conducted. The abstracts from this search were examined, the descriptors were refined, and a computer search of Psychological Abstracts was conducted. Appropriate abstracts were also taken from Blindness, Visual Impairment, Deaf-Blindness Annotated Listing of the Literature (BVIDB) and from Dissertation Abstracts. Since very little research was done in the area of low vision before the 1950's through 1985 when it was completed with approximately 500 abstracts.

Abstracts from these computer searches were evaluated, and the bibliographic information was put into American Psychological Association (APA) format. Abstracts were evaluated according to the following criteria:

1. Research must be of a specific, nonmedical nature.
2. It must contain evidence of empirical not descriptive or historical research.
3. It must involve more than one subject.

All abstracts were alphabetized, and a check for duplications was made. At this point abstracts of 141 articles published from 1953 through 1985 remained.

For ease in analyzing the information, the abstracts were grouped alphabetically by authors under the following 28 subtopics:

- Assessment
- Audition
- Black Light
- Behavior Reinforcement
- Characteristics and Behaviors
- Closed-Circuit TV
- Computers
- Conservation of Matter
- Contrast and Color
- Demographics
- Driving
- Educational Plans
- Employment and College Preparation
- Intelligence
- Lighting
- Low Vision Aids Training
- Mathematics
- Microfiche
- Miscellaneous
- Mobility
- Motor Performance
- Optical Aids
- Reading
- Self-Concept
- Tactual Perception
- Teacher and Family Training
- Type Size and Style
- Visual Efficiency Training

If an article pertained to more than one of the subtopics, it was grouped under the one which seemed to be of prime importance.

A brief introduction was written completing work on the bibliography.

From this bibliography, it was possible to see where research efforts had been concentrated in the past according to the number of articles reported for each area (see Table 1).

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Insert Table 1 about here

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Although this ranking by number of articles gave an indication of where research efforts had been concentrated in the past, its value for predicting the course future research should take was questionable. For example, if there was a lot of research reported on a certain topic, did it mean the following:

1. that this was too general a topic and, therefore, many articles fell under it?
2. that this was a topic which had just about been exhausted?
3. that this was a major topic of concern and there was still much to find out about it?
4. that many rather short and maybe even inconsequential studies had been published in this area making it appear more important than it really is?
5. that maybe the studies reported were outdated and needed updating in the light of new developments?

Likewise, if only a small amount of research was reported on a certain topic, did it mean the following:

1. that this was too specific a topic and should have been combined with something else?
2. that this was a new topic which was just beginning to become important?
3. that this was an unimportant topic and probably should not have been researched in the first place?
4. that this was the definitive research on this topic and, therefore, no more was needed?

There was also the possibility that in spite of best efforts, some studies might have been omitted that would have had an effect on the rankings.

#### Gathering and Interpreting Data, Part II

Because of the difficulties in using the bibliography alone to predict the future direction low vision research should take, the decision was made to enlist the help of experts in the field of low vision. Experts were selected who were nationally known for their work in this area and who represented a good cross-section of work with the low vision population. A total of seven experts were contacted. Each expert was asked to review the bibliography which had been compiled and to write a "think piece" identifying research needs for low vision and citing pertinent research.

Of the seven experts contacted, one did not feel she had time and no bibliography was sent. Of the six who were sent bibliographies, two never responded.

"Think pieces" were received from the following four low vision experts:

Natalie C. Barraga, Ed.D.  
Professor Emerita  
The University of Texas at Austin  
College of Education  
Austin, TX 78712-1290

Nan C. Dempsey  
Supervisor of Education Services  
New Jersey Commission for the  
Blind and Visually Impaired  
Department of Human Services  
519 Federal Street  
403 Parkade Building  
Camden, NJ 08103

Randall T. Jose, O.D.  
Director of Clinical Services  
Low Vision Clinic  
College of Optometry  
University of Houston  
3530 West Dallas  
Houston, TX 77019

M. Beth Langley  
Teacher  
Penellas County School System  
6000 70th Avenue North  
Penellas Park, FL 33565

Dempsey reached an interesting conclusion after reading the bibliography. She states it as follows:

As I read the articles on low vision I was somewhat surprised at the number and diversity of the research projects. One thing struck me immediately--the small number of research projects done in the eighties--only 38 in all. I began to wonder whether (a) researchers felt there was no need for further studies (b) funding has become so scarce that such research cannot be supported or (c) there may be little interest in low vision research. I concluded that (a) could



not be correct because almost every article concluded with an indication of the need for further research on that topic. I decided that (c) could not be correct because the needs of low vision persons are currently being given priority consideration by schools and agencies. This leads me to the point that a high priority must become that of securing stable sources of funding for such research projects.

Except for this one pervasive need, each "think piece" seemed to offer many diverse ideas for specific research projects. Barraga anticipated this outcome when, in her cover letter accompanying her "think piece," she said, "You may be like the little boy who told the librarian when she brought out a stack of books on penguins that he didn't believe he wanted to know that much."

Comparison was a bit difficult since each "think piece" was unique. Barraga's "think piece" was child oriented with clear, concise statements outlining educational research projects. Dempsey's "think piece" was well-rounded with concisely stated research suggestions and interesting observations about previous research and the current state of the art. Jose pinpointed particular visual problems and research that is needed in connection with them; he takes an optimistic look at the future based on new technology and the ensuing evolution he expects in optical aids. Langley evaluated research in the bibliography well and emphasized in a more rambling style, research she would like to see done, particularly in regard to child training.

In spite of these differences, there was at least one commonality that made some comparison possible. Since all the experts had read the bibliography before writing their "think pieces," they all used the topics presented, at least to some extent, to organize their research ideas for their "think pieces." This, then, became the starting point for organizing the suggested research ideas for further analysis.

A comparison of the topics included in the bibliography with the topics for which research was suggested indicated several differences. First, the following topics from the old list did not appear in the new list: Intelligence, Mathematics, Teacher and Family Training, Type Size and Style, and Miscellaneous. Then, the following new topics were suggested: Acceptance (Social) and Sports and Games. Intelligence now seemed to be included in studies of Characteristics. The only proposed research that might have fallen under the area of Teacher and Family Training seemed to have more in common with the research suggested in the new area of Acceptance

(Social) rather than with the studies on Teacher and Family Training in the bibliography. The old category Miscellaneous contained only studies, one on a sensory playground which might relate to the research suggested under the new topic of Sports and Games and one on aesthetic sensitivity which probably falls under the area of Characteristics. The only research relating to Type Size and Style which was suggested had to do with reading from the monitor of a computer and thus, was classified under Computers. Since no research relating directly to Mathematics or Type Size and Style was suggested, it can be surmised that these areas may no longer be considered as important as they once were. On the other hand, since several suggestions for research were given under the new topics of Acceptance and Sports and Games, these areas may be gaining in importance.

Research suggestions were categorized and recorded in a paraphrased version by the investigator under the appropriate topics crediting the originator of each. Differences in writing style, wording, and even the amount included in each research suggestion made this a rather subjective process. Suggestions for specific research projects under each topic were compared to determine if two or more of the four experts writing the "think pieces" were really stating the same need, and if so the suggestions were combined into one. When this process was completed, a total of 97 research needs had been established. (See Appendix A.)

Using this information, the areas of research were ranked according to the number of research suggestions given under each area (See Table 2).

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Insert Table 2 about here

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Because these research topics were similar to those used in the bibliography, a comparison of Table 1 and Table 2 proved to be interesting. Although Characteristics and Behaviors now ranked first and in the bibliography it had ranked 1.5, this area now represented 10% of the total number of research suggestions. This was down 4% from the total number of articles in the bibliography. Assessment, on the other hand, had gained 5% and had moved up in ranking from 7 to 2.5. Visual Efficiency Training now represented an additional 3% of the total and had moved up from 4 to 2.5. Low Vision Aids Training now ranked 4, up dramatically from 22.5 in the bibliography. This tied with CCTV for the largest gain at 7%.

CCTV, however, had moved from 3 to 8 in rank. Black Light and Computers had also made dramatic moves in ranking from 22.5 to 5.5 with increases of 5% each. Optical Aids, although still a popular topic, showed the most dramatic decrease with 9% less of the total and a drop in ranking from 1.5 to 8.

There was at least some agreement among the experts on 16 of the research suggestions. Table 3 shows these suggestions ranked in order of agreement.

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Insert Table 3 about here

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It should be noted from Table 3 that of the 16 suggestions for research where there was some agreement, 25% were in the area of Low Vision Aids Training. One of these suggestions was given by all four experts, two by three of the four experts and one by two of the experts. The only other suggestion upon which more than two of the experts agreed was in the area of Computers.

Suggestions for research were next classified according to three kinds of research: (a) Aids or products development or information, (b) Basic research about the population, and (c) Curriculum development or training information. Table 4 shows both the classification of all research suggestions and the classification of the research suggestions on which there was some agreement among the experts.

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Insert Table 4 about here

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Basic research, suggestions accounted for the largest number in both groups by a big majority. Of the 16 suggestions where there was some agreement among the experts one-fourth of the suggestions were for curricular development or training information, however, this kind of research at 10.3% represented the smallest portion of the total number of suggestions.

As the experts wrote their "think pieces," they cited a total of 35 research articles. Of these references 26 were included in the bibliography. Of the remaining nine articles, two were found and then rejected because they did not meet the project's criteria,



and at least two were not available when the bibliography was completed. The remaining five citations are either too incomplete to find or were from a body of research such as NASA's military technology not normally accessed for research on education of the visually handicapped. From this, it can be concluded that the bibliography was fairly comprehensive.

### Summary of Results

The first goal of this study, that of reviewing and evaluating existing research on low vision, was fulfilled with the completion in 1985 of an annotated bibliography of 141 specific nonmedical research articles of an empirical nature involving more than one subject. Articles covered the time from the 1950's through 1985 and were classified under 28 subtopics. According to the number of articles, the five most popular subtopics or areas for research in the past were as follows:

- 1.5 Characteristics and Behaviors
- 1.5 Optical Aids
- 3 CCTV
- 4 Visual Efficiency Training
- 5 Demographics

The second goal of this study, to identify current research needs for low vision, involved having four experts in low vision review the bibliography and write "think pieces" identifying research needs and citing pertinent research. From her review of the bibliography Dempsey concludes that "a high priority must become that of securing stable sources of funding for such research projects." According to the number of research suggestions, the six (five and six had the same number) most needed subtopics or areas for research are as follows:

- 1 Characteristics and Behaviors
- 2.5 Assessment
- 2.5 Visual Efficiency Training
- 4 Low Vision Aids Training
- 5.5 Black Light
- 5.5 Computers

The five areas which showed the largest percentage of increase of suggestions over past research were as follows:

- 1.5 Low Vision Aids Training
- 1.5 CCTV

- 4 Assessment
- 4 Black Light
- 4 Computers

There were 16 research suggestions on which at least two of the three experts agreed. Of these they all agreed that there is a need to research specific appropriate aids for various eye conditions, distances, and tasks. Three of the four also agreed that there is a need (1) to study the age and/or developmental level at which to begin training, (2) to identify characteristics that determine successful aid use, and (3) to study type color, size, and style; spacing; degree of positive or negative contrast; screen color; brightness; complexity; and fatigue. When the research suggestions were categorized by kinds of research--that having to do with aids or products, basic research, or curriculum development or training information, basic research was strongly identified as the most needed.

### Discussion

In the past much of the emphasis at APH in the area of low vision has focused on the development of aids or products such as the Light Box, Variable Intensity Study Lamp, bold line writing paper, and large print. Now the time has come to consider doing some basic research on characteristics and behaviors, etc. for this, the majority of the visually handicapped population. Such research should lead to well-defined, research-based training programs in the future.

One of the obstacles to doing research in this field has been the diversity of the population. The solution to this problem may be to follow the lead of Jose who often discussed needed research in terms of an eye problem, such as night vision, binocularity, retinitis pigmentosa, macular degeneration, etc. rather than attempting to look at the low vision population as a whole. Since it would not be feasible to do research for each eye condition, it would be worthwhile to survey the population first to see which groups constitute the largest portions of the population. Even though only 50% of the experts agree on this suggestion (See Table 3, Characteristics and Behaviors), it may be the most logical place to start.

Another logical place to start might be the suggestion about studying type size, etc. for the computer. Not only did three out of four experts suggest this as a need, it is something that could be done within a relatively short amount of time and for which results could be applied in developing hardware and software.

If any of the research suggestions in the area of Low Vision Aids Training are undertaken Randy Jose would certainly be a good resource person to use based on the knowledge, experience, and insights he exhibited in his "think piece."

This project has shown that much has been accomplished in meeting the research needs for low vision in the past 30 years. However, judging from the 97 suggestions for research presented by only four experts in the area, there is still much to do.



## References

- Berla', E., & Willis, D. (1981). Department of educational research report of research and development activities. Louisville, KY: American Printing House for the Blind.
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## Appendix A

### Acceptance (Social)

1. Research social acceptance of low vision children in the classroom (D & J)
  - A. Improve teacher acceptance
  - B. Improve peer acceptance
  - C. Accommodate the visually handicapped child and his or her aids in the classroom
2. Study the effect of a child's inability to see facial expressions on a child's personality and peer interaction (J)

### Assessment

1. Update the Diagnostic Assessment Procedure (DAP) from the Program to Develop Efficiency in Visual Functioning (B)
2. Expand use of the DAP to include the mentally retarded (B)
3. Assess infants and young children, especially multihandicapped (D)
4. Develop a comprehensive, integrated evaluation of visual functioning to aid in selection of training materials and settings, illumination needs, low vision aids, reading materials, and appropriate life-function activities (i.e., driving) which could be used over time to measure individual's development or regression against a baseline determining validity and reliability first with sighted individuals or with sighted individuals as a control group without visual aids or adaptations and then with visual aids or adaptations to determine the effectiveness or lack of it (L)
5. Identify the clinical tests and data most pertinent to educators, rehab counselors, social workers, etc. (J)
6. Investigate further clinical applications of contrast sensitivity testing, color vision testing, glare and illumination adaptation, better functional fields, etc. as to their relevance to a person's ability to function (J)
7. Differentiate between a multihandicapped low functioning child's inability to learn a concept or perform a task because of not being able to see or not understanding (J)
8. Develop tests for nonverbal or noncommunicative patients including acuity, fields, color vision, and binocularity for earlier more appropriate intervention (J)
9. Field test revised medical and educational reporting forms on a national basis (D)

### Audition

1. Research the developmental hierarchy, schedule of acquisition, differences if any in congenitally blind and adventitiously blind developmental process, figure-ground skills, dichotic listening (see research for disabled), the relationship of specific visual diagnoses to listening, and whether the order of development is the same in both cognitively intact and cognitively disordered individuals (L)
2. Research audiological factors to cut down on figure-ground confusion and to produce pure sounds and speech (L)

### Behavior Reinforcement

1. Follow up Swanson's (1977) effort showing that M&M's and praise had a positive effect on academic achievement, using a large number of subjects of different ages (D)
2. Study contingency learning and training as opposed to artificially reinforced learning and training (Utley et. al. in TASH about 1984) (L)

### Black Light

1. Research whether black light stimulates vision, motivates use, or both (L & J)
2. Research the introduction of normal light following training with black light--equal amounts of training with each simultaneously on identical tasks, etc. (D & L)
3. Determine if there is a specific sequence of tasks most effective for developing visual functioning (L)
4. Determine most effective colors (L)
5. Study the relationship between visual diagnosis and safe distance, intensity, and duration (L)
6. Study the relationship between black light and seizures (L)

### Characteristics and Behavior

1. Follow-up Costelloe's (1974) research focusing on observed behavioral problems that accompany visual handicaps and how these differences are perceived by significant persons in the child's life (D)
2. Determine whether nonconforming behavior is caused by visual impairment or by "parenting style" with assumed expectations resulting from visual impairment (L)

3. Research the relationship between the development of "mannerisms" and neuromotor/oculomotor dysfunction and whether "mannerisms" are critical to optimum visual functioning and likely to be associated with specific diagnoses, levels of acuity, neurological functioning, cognitive functioning, motivation, etc. (L)
4. Do a survey of learning media, type of school placement, and IQ's (B & D)
5. Do "time" studies to determine efficiency of media (B)
6. Compare achievement of low vision and normally sighted children in various learning areas (B & D)
7. Relate visual characteristics to cause of impairment (B & J)
  - A. Binocularity: Determine the relationships between focusing, accommodation, blurred vision, and vergence movements for the visually impaired eye
  - B. Retinitis Pigmentosa: Determine the level of field necessary for normal function, the amount of scanning normally done by a person with a small field, the effects of contrast on the small central field as compared to that on a full central field, and vital daily living handicapping situations
8. Relate distance, color, and lighting conditions to recognition and identifications of objects, pictures, and line drawings (B)
9. Determine whether there is a significant relationship between organization of thought process--classification, etc.--and use of residual vision (L & J)
10. Determine whether delayed visual/motor skills as compared to auditory/vocal skills is normal for population with impaired vision (L)

#### CCTV

1. Compare the effectiveness of CCTV training, no training, traditional training with aids such as large print, and training with a combination of CCTV and traditional training for overall achievement, reading rates, handwriting, expanding Genesky's 1970 study nationwide (B & D)
2. Compare the adjustment to portable aids by students who have been using CCTV exclusively, traditional aids such as large print but no CCTV, and a combination of traditional aids and CCTV (J)
3. Study the relationship between an individual's ability to use CCTV and perceptual problems (L)



4. Develop miniature (briefcase size) CCTV systems with high contrast and portability (J)
5. Determine whether using CCTV and regular print books made an individual feel more normal than using large print books (J)

#### Computers

1. Study type color, size, and style; spacing; degree of positive or negative contrast; screen color; brightness; complexity and fatigue (B, D, & L)
2. Study the transfer from video screen to regular print and vice versa (B)
3. Study identification of graphics (B)
4. Study the relationship between voice output and use of vision (L)
5. Research the possibilities of using computers with low-functioning, multihandicapped individuals to stimulate functional vision through contingent reinforcement (L)

#### Conservation of Matter

1. Study all Piagetian tasks in relation to degree of vision and performance of functional tasks--could use DAP and correlate with Piagetian assessment (B)

#### Contrast and Color

1. Use Corn's 3-D model to study individual characteristics in relation to visual abilities and environmental cues (B)
2. Study speed of reading and achievement of group using yellow filters and other colors with regular print in relation to group not using filters (B)
3. Research the relationship between diagnosis and contrast and illumination needs (L)
4. Research the relationship between acuity and field to proximity and spacing, print size, figure-ground complexity and print style (L)

#### Demographics

1. Continue to study the changing nature of the visually impaired population to identify disease entities presenting themselves more often, age groups, level of visual impairment, multihandicapping conditions, etc. in order to design delivery systems, provide direct training and initiate new designs in optical aids and other rehabilitative instrumentation (J)



### Driving

1. Follow-up Kelleher's (1979) study comparing driving records nationwide of low vision persons who use bioptics with those who do not (D)
2. Research the level of acuity (now 20/120) acceptable for driving, the visual field (now 140°) acceptable for driving, modifications of the automobile or optical devices for a visually impaired driver to enhance the margin of safety (J)

### Educational Plans

1. Compare achievement and learning media of low vision children with low vision training to those without (B)
2. Compare educational plans in the areas of low vision training, mobility, etc. for low vision children with those for totally blind children and normally seeing children (B)
3. Update Stephens (1969) study comparing special class, resource, and itinerant plans for teaching partially seeing children (D)

### Employment and College Prep

1. Compare career choices of low vision, normally seeing, and totally blind persons (B)
2. Study low vision persons successful in careers or vocations not normally considered appropriate for low vision persons (B)
3. Study independent travel of low vision persons and devices used (B)
4. Investigate modifications of work environments needed so visually impaired can obtain competitive jobs without interrupting productivity and coordinate rehab, clinical, and education programs so that visually impaired individuals experience these conditions in the educational setting prior to entering rehabilitation (J)
5. Research the statement: visually impaired individuals for the most part will not be as productive as a sighted person in almost all vocational settings (J)

### Lighting

1. Develop compact, cosmetically acceptable lighting systems (L & J)
  - A. which could be dimmed or brightened independently of each other

- B. which could be arranged to prevent glare and shadows
- C. which could include black light for night vision problems
- D. which include mobility canes with optic fiber
- 2. Study preferred conditions for various tasks--reading, moving around the environment, daytime and nighttime viewing of sporting events, etc. (B)

#### Low Vision Aids Training

- 1. Study age and/or developmental level at which to begin, considering increase in complexity and detail that comes with age--more information, smaller print, closer proximity, etc. (B, L, & J)
- 2. Research specific appropriate aids for
  - A. specific diagnoses and acuities (L)
  - B. specific distances (D)
  - C. specific tasks--hand-held or spectacle type (B)
    - (1) daily classroom activities (J)
    - (2) day-to-day needs of the elderly trying to maintain an independent lifestyle (J)
- 3. Determine whether there is a hierarchy in which low vision aids should be introduced (L)
- 4. Identify characteristics that determine successful use (D, L, & J)
  - A. motivation
  - B. scanning and organization processes (neurological/cognitive status)
  - C. visual diagnosis
  - D. motor control
  - E. number of siblings
  - F. self-confidence
  - G. positive attitude toward the use of residual vision
  - H. lack of depressive symptoms
- 5. Develop new techniques pinpointing particular activities and conditions (J & B)
  - A. lighting
  - B. tracking
  - C. print size
  - D. working distances
  - E. fatigue
  - F. accommodation
  - G. scanning
  - H. level of reading material
  - I. length of time
  - J. other psychological factors

6. Determine if special perceptual skills must be learned when utilizing devices that magnify and reduce field (i.e., a person with poor part/whole skills and lousy visual memory will probably do poorly with telescopes in spite of good central acuity) (J)
7. Research the effect of prism lenses on students with neuromotor disorders (L)
8. Research logically "consequated" acquisition of visual behaviors verses the "look at" approach (L)

#### Microfiche

1. Evaluate effectiveness of microfiche as a reading aid using more subjects (D)

#### Mobility

1. Determine how vision can be used for orientation, to direct movement, and to perceive location (B & D)
  - A. Alone
  - B. With a cane for safety and/or
  - C. With monoculars or other low vision aids
2. Determine the most effective training strategies and follow-up to insure use of the cane. (D & J)  
Perhaps as follows:
  - A. Minimal initial training
  - B. Time to utilize skills learned in familiar environment
  - C. Comprehensive refresher course
  - D. More utilization time
  - E. Then advanced or follow-up course

#### Motor Performance

1. Study gross and fine motor development in low vision children with and without early intervention (B)

#### Optical Aids

1. Update Bailey's (1978) comparison of different types of "expanded field" bioptic systems to include newer, more sophisticated types now being prescribed (D)
2. Update Brazelton's (1970) study including the proliferation of new aids (D)
3. Follow-up Kennedy's (1977) study of an inexpensive field expander for RP patients if results were positive (D)
4. Develop optimum optical aids which provide different levels

- of magnification, contrast, working distances, varying visual fields and scanning capabilities, lighting, develop better fixation skills, improve the individuals collective visual skills, and are cosmetically acceptable (J)
5. Research the use of such things as movable reading stands and prismatic scanning to cut down on dependence on CCTV (J)

#### Reading

1. Replicate 1950 and 1960 studies on speed, type size, type style, etc. (B)
2. Replicate in the United States Fridal's (1981) use of experimental reading courses designed for low vision students in Denmark which increased proficiency dramatically (D)

#### Self-Concept

1. Study how the use of optical aids effects the self-concept (J)
2. Study how use of a cane effects the self-concept (J)
3. Study self-concepts of parents of visually handicapped children in relationship to the size of the family, health of the other siblings, self-concepts of the visually handicapped children, and the handicapped children's functioning and acceptance of their handicaps (J)

#### Sports and Games

1. Develop or modify sports equipment which would allow visually handicapped children to compete with the sighted in routine children's games (J)

#### Tactual Perception

1. Research the development of low vision children, adults, and the multihandicapped as compared to sighted individuals (L)
2. Determine when tactual skills assist and when they interfere with low vision training (L)

#### Visual Efficiency Training

1. Verify the effectiveness of the sequential approach as related (B)
  - A. To IQ

- B. To visual condition
- C. To location of impairment (central or peripheral)
- D. To age
- 2. Determine characteristics which effect visual efficiency (D)
- 3. Determine if there is a transference from light stimulus skills to object stimulus skills and if so, how much training is practical for this transference to take place (J)
- 4. Determine the amount of time necessary to make a difference in the development and application of residual vision (L)
- 5. Define the low vision teacher's role according to amount of time to be spent enhancing vision as approach to tutoring (L)
- 6. Develop a minimal set of guidelines regarding optimal time and intensity of service relevant to specific visual disability (L)
- 7. Research perceptual and ocular motor skills needed to compensate for field lost--retinitis pigmentosa (J)
- 8. Determine how much field loss is significant before rehabilitation services are necessary--retinitis pigmentosa (J)
- 9. Determine how an individual learns to eccentrically view and which part of the retina is most effective to view to--macular degeneration (J)

Key

B-Barraga

D-Dempsey

J-Jose

L-Langley



Table 1

Areas of Research Ranked by Number of Articles Reported in the Bibliography

Rank	Area of research	No. of articles	% of articles
1.5	Characteristics & Behaviors	20	14
1.5	Optical Aids	20	14
3	CCTV	17	12
4	Visual Efficiency Training	9	6
5	Demographics	7	5
7	Assessment	5	4
7	Contrast & Color	5	4
7	Reading	5	4
11	Conservation of Matter	4	3
11	Driving	4	3
11	Educational Plans	4	3
11	Employment & College Prep	4	3
11	Lighting	4	3
15.5	Audition	3	2
15.5	Tactual Perception	3	2
15.5	Teacher & Family Training	3	2
15.5	Type Size or Style	3	2
22.5	Behavior Reinforcement	2	1
22.5	Black Light	2	1
22.5	Computers	2	1
22.5	Intelligence	2	1
22.5	Low Vision Aids Training	2	1
22.5	Microfiche	2	1
22.5	Miscellaneous	2	1
22.5	Mobility	2	1
22.5	Motor Performance	2	1
22.5	Self Concept	2	1
28	Mathematics	1	1



Table 2

Areas of Research Ranked by Number of Suggestions Given in the  
"Think Pieces"

Rank	Area of research	No. of suggestions	% of suggestions
1	Characteristics & Behaviors	10	10
2.5	Assessment	9	9
2.5	Visual Efficiency Training	9	9
4	Low Vision Aids Training	8	8
5.5	Black Light	6	6
5.5	Computers	6	6
8	CCTV	5	5
8	Employment & College Prep	5	5
8	Optical Aids	5	5
10	Contrast & Color	4	4
11.5	Educational Programs	3	3
11.5	Self-Concept	3	3
16.5	Acceptance (Social)	2	2
16.5	Audition	2	2
16.5	Behavior Reinforcement	2	2
16.5	Driving	2	2
16.5	Lighting	2	2
16.5	Mobility	2	2
16.5	Reading	2	2
16.5	Tactual Perception	2	2
23	Conservation of Matter	1	1
23	Demographics	1	1
23	Microfiche	1	1
23	Motor Performance	1	1
23	Sports & Games	1	1

Table 3

Research Suggestions Ranked by Amount of Agreement Among the Four Experts

Amount of agreement	Area	Research suggestions
100%	Low Vision Aids Training	Research specific appropriate aids for various eye conditions, distances, & tasks.
75%	Low Vision Aids Training	Study the age and/or developmental level at which to begin training.
75%	Low Vision Aids Training	Identify characteristics that determine successful aid use.
75%	Computers	Study type color, size, and style; spacing; degree of positive or negative contrast; screen color, brightness; complexity; and fatigue.
50%	Characteristics & Behaviors	Do a survey on learning media, type of school placement, and IQ.
50%	Characteristics & Behaviors	Compare achievement of low vision and normally sighted children in various learning areas.
50%	Characteristics & Behaviors	Relate visual characteristics to cause of impairment.
50%	Characteristics & Behaviors	Determine whether there is a significant relationship between organization of thought process--classification, etc.--and use of residual vision.
50%	Black Light	Research whether black light stimulates vision, motivates use, or both.
50%	Black Light	Research introduction of normal light following training with black light.

Table 3 (continued)

Research Suggestions Ranked by Amount of Agreement Among the Four Experts

Amount of agreement	Area	Research suggestions
50%	Mobility	Determine how vision can be used for orientation, to direct movement, and to perceive location, alone, with a cane, or with other low vision aids.
50%	Mobility	Determine the most effective training strategies and follow-up to insure use of the cane.
50%	Acceptance	Research social acceptance of low vision children in classroom.
50%	CCTV	Compare the effectiveness of CCTV training, no training, traditional training with aids such as large print, and training with a combination of of CCTV and traditional training.
50%	Lighting	Develop compact, cosmetically acceptable lighting systems.
50%	Low Vision Aids Training	Develop new techniques pinpointing particular activities and conditions-- lighting, tracking, print size, working distances, fatigue, accommodation, scanning, level of reading material, length of time, and other psychological factors.

Table 4

Research Suggestions Classified According to Kind of Research Involved

Research suggestions	Aids	Basic	Curricular
Total of 97	14.4%	75.2%	10.3%
16 with agreement	12.5%	62.5%	25.0%